IN THE CLAIMS:

1. (Previously Presented) A biosensor comprising:

(a) a two-dimensional grating;

(b) a substrate that supports the two-dimensional grating; wherein the refractive index of the two-dimensional grating is greater than the refractive index of the substrate; and

(c) one or more specific binding substances immobilized on the surface of the two-dimensional grating opposite of the substrate layer; wherein the one or more specific binding substances are bound to their binding partners and wherein one or more specific binding substances and their binding partners are detection label-free wherein, when the biosensor is illuminated a resonant grating effect is produced on a reflected radiation spectrum, and wherein the depth and period of the two-dimensional grating are less than the wavelength of the resonant grating effect.

2. (Original) The biosensor of claim 1, wherein a narrow band of optical wavelengths is reflected from the biosensor when the biosensor is illuminated with a broad band of optical wavelengths.

3. (Original) The biosensor of claim 1, wherein the substrate comprises glass, plastic or epoxy.

4. (Original) The biosensor of claim 1, wherein the two-dimensional grating is comprised of a material selected from the group consisting of zinc sulfide, titanium dioxide, tantalum oxide, and silicon nitride.

5. (Previously Presented) The biosensor of claim 1, further comprising a cover layer on the surface of the two-dimensional grating opposite of the substrate, wherein the one or more specific binding substances are immobilized on the surface of the cover layer opposite of the two-dimensional grating.

6. (Previously Presented) The biosensor of claim 5, wherein the cover layer comprises a material that has a lower refractive index than zinc sulfide, titanium dioxide, tantalum oxide, or silicon nitride.

7. (Original) The biosensor of claim 6, wherein the cover layer comprises a material selected from the group consisting of glass, epoxy, and plastic.

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001

8. (Original) The biosensor of claim 1, wherein the two-dimensional grating has a period of about 0.01 microns to about 1 micron and a depth of about 0.01 microns to about 1 micron.

9. (Original) The biosensor of claim 1, wherein the one or more specific binding substances are arranged in an array of distinct locations.

10. (Original) The biosensor of claim 1, wherein the one or more specific binding substances are immobilized on the two-dimensional grating by physical adsorption or by chemical binding.

11. (Original) The biosensor of claim 9, wherein the distinct locations define a microarray spot of about 50-500 microns in diameter.

12. (Canceled)

13. (Original) The biosensor of claim 1, wherein the one or more specific binding substances are selected from the group consisting of nucleic acids, polypeptides, antigens, polyclonal antibodies, monoclonal antibodies, single chain antibodies (scFv), F(ab) fragments, $F(ab')_2$ fragments, Fv fragments, small organic molecules, cells, viruses, bacteria, and biological samples.

14. (Original) The biosensor of claim 13, wherein the biological sample is selected from the group consisting of blood, plasma, serum, gastrointestinal secretions, homogenates of tissues or tumors, synovial fluid, feces, saliva, sputum, cyst fluid, amniotic fluid, cerebrospinal fluid, peritoneal fluid, lung lavage fluid, semen, lymphatic fluid, tears, and prostatitc fluid.

15. (Currently Amended) The biosensor of claim 1 ~~12~~, wherein the binding partners are selected from the group consisting of nucleic acids, polypeptides, antigens, polyclonal antibodies, monoclonal antibodies, single chain antibodies (scFv), F(ab) fragments, $F(ab')_2$ fragments, Fv fragments, small organic molecules, cells, viruses, bacteria, and biological samples.

16. (Original) The biosensor of claim 15, wherein the biological sample is selected from the group consisting of blood, plasma, serum, gastrointestinal secretions, homogenates of tissues or tumors, synovial fluid, feces, saliva, sputum, cyst fluid, amniotic fluid, cerebrospinal fluid, peritoneal fluid, lung lavage fluid, semen, lymphatic fluid, tears, and prostatitc fluid.

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001

17. (Original) A liquid-containing vessel comprising the biosensor of claim 1 as an internal surface.

18. (Original) The liquid-containing vessel of claim 17, wherein the vessel is selected from the group consisting of a microtiter plate, a test tube, a petri dish and a microfluidic channel.

19. (Original) A detection system comprising the biosensor of claim 1, a light source that directs light to the biosensor, and a detector that detects light reflected from the biosensor, wherein a polarizing filter occurs between the light source and the biosensor.

20. -58. Canceled

59. (Previously Presented) A biosensor composition comprising two or more biosensors of claim 9 wherein the biosensors are associated with a holding fixture.

60. (Original) The biosensor composition of claim 59, wherein the composition comprises about 50 to about 1,000 individual biosensors.

61. (Original) The biosensor composition of claim 59, wherein the composition comprises about 96 biosensors.

62. (Original) The biosensor composition of claim 59, wherein the composition comprises about 384 biosensors.

63. (Original) The biosensor composition of claim 59, wherein the two or more biosensors each comprise about 25 to about 1,000 distinct locations.

64. (Original) The biosensor composition of claim 59, wherein each biosensor is about 1 mm^2 to about 5 mm^2.

65. (Original) The biosensor composition of claim 59, wherein each biosensor is about 3 mm^2.

66. (Original) The biosensor composition of claim 59, wherein the holding fixture holds each biosensor such that each biosensor can be placed into a separate well of a microtiter plate.

67. (Previously Presented) A biosensor composition comprising one or more biosensors of claim 1 on a tip of a multi-fiber optic probe.

68. (Previously Presented) The biosensor composition of claim 67, wherein the one or more biosensors are fabricated on the tip of the probe.

69. (Original) The biosensor composition of claim 67, wherein the one or more biosensors are attached onto the tip of the probe.

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001

70. Canceled

71. (Original) A detection system comprising:

(a) the biosensor of claim 1;

(b) a laser source that directs a laser beam to a scanning mirror device, wherein the scanning mirror device is used to vary the laser beam's incident angle;

(c) an optical system for maintaining columination of the incident laser beam;

(d) and a light detector.

72. (Original) The detection system of claim 71, wherein the scanning mirror device is a linear galvanometer.

73. (Original) The detection system of claim 72, wherein the linear galvanometer operates at a frequency of about 2 Hz to about 120 Hz and a mechanical scan angle of about 10 degrees to about 20 degrees.

74. (Original) The detection system of claim 71, wherein the laser is a diode laser with a wavelength selected from the group consisting of 780 nm, 785 nm, 810 nm, and 830 nm.

75.-99. Canceled

100. (Original) The biosensor of claim 1, further comprising an antireflective dielectric coating on a surface of the substrate opposite of the two-dimensional grating.

101. (Previously Presented) The biosensor of claim 1, wherein the biosensor is attached to a bottomless microtiter plate.

102.-109. Canceled

110. (Previously Presented) An array of polynucleotides comprising:

(a) a two-dimensional grating;

(b) a substrate that supports the two-dimensional grating; wherein the refractive index of the two-dimensional grating is greater than the refractive index of the substrate; and

(c) one or more types of polynucleotides attached at distinct locations of the two-dimensional grating opposite the substrate; wherein the one or more polynucleotides are bound to one or more specific binding substances, and wherein the one or more polynucleotides and the one or more specific binding substances are detection label-free;

wherein, when the array of polynucleotides is illuminated a resonant grating effect is produced on the reflected radiation spectrum, wherein the depth and period of the two-dimensional grating are less than the resonant grating effect wavelength.

111. (Previously Presented) The array of polynucleotides of claim 110, wherein a narrow band of optical wavelengths is reflected from the array when the array is illuminated with a broad band of optical wavelengths.

112. (Previously Presented) The array of polynucleotides of claim 110, wherein the substrate comprises glass, plastic or epoxy.

113. (Previously Presented) The array of polynucleotides of claim 110, wherein the two-dimensional grating is comprised of a material selected from the group consisting of zinc sulfide, titanium dioxide, tantalum oxide and silicon nitride.

114. (Previously Presented) The array of polynucleotides of claim 110, wherein the substrate and the two-dimensional grating comprise a single unit, wherein the surface of the single unit comprising the two-dimensional grating is coated with a material having a refractive index that is greater than the refractive index of the substrate.

115. (Previously Presented) The array of polynucleotides of claim 114, wherein the single unit is comprised of a material selected from the group consisting of glass, plastic and epoxy.

116. (Previously Presented) The array of polynucleotides of claim 114, wherein the material is selected from the group consisting of zinc sulfide, titanium dioxide, tantalum oxide and silicon nitride.

117. (Previously Presented) The array of polynucleotides of claim 110, wherein the two-dimensional grating is comprised of a repeating pattern of shapes selected from the group consisting of squares, circles, ellipses, triangles, trapezoids, sinusoidal waves, ovals, rectangles and hexagons.

118. (Previously Presented) The array of polynucleotides of claim 117, wherein the repeating pattern of shapes are arranged in a rectangular grid or hexagonal grid.

119. (Previously Presented) The array of polynucleotides of claim 110, wherein the two-dimensional grating has a period of about 0.01 microns to about 1 micron and a depth of about 0.01 microns to about 1 micron.

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001

120. (Previously Presented) The array of polynucleotides of claim 110, further comprising an antireflective physical structure that is embossed into a surface of the substrate opposite of the two-dimensional grating.

121. (Previously Presented) The array of polynucleotides of claim 120, wherein the antireflective physical structure is a motheye structure.

122. (Previously Presented) A detection system comprising the array of polynucleotides of claim 110, a light source that directs light to the array of polynucleotides, and a detector that detects light reflected from the array of polynucleotides.

123. (Previously Presented) The detection system of claim 122, further comprising a fiber probe comprising one or more illuminating optical fibers that are connected at a first end to the light source, and one or more collecting optical fibers connected at a first end to the detector, wherein the second ends of the illuminating and collecting fibers are arranged in line with a collimating lens that focuses light onto the array of polynucleotides.

124. (Previously Presented) The detection system of claim 123, wherein the illuminating fiber and the collecting fiber are the same fiber.

125. (Previously Presented) The detection system of claim 122, wherein the light source illuminates the array of polynucleotides from its top surface or from its bottom surface.

126.-128. Canceled

129. (Previously Presented) An array of polynucleotides comprising:

(a) a two-dimensional grating;

(b) a substrate that supports the two-dimensional grating; wherein the refractive index of the two-dimensional grating is greater than the refractive index of the substrate; and

(c) a cover layer on a surface of the two-dimensional grating opposite of the substrate;

(d) one or more types of polynucleotides attached at distinct locations to the cover layer,

(e) wherein the one or more types of polynucleotides are bound to their binding partners and wherein the one or more types of polynucleotides and their binding partners are detection label-free,

wherein, when the array is illuminated a resonant grating effect is produced on the reflected radiation spectrum, wherein the depth and period of the two-dimensional grating are less than the resonant grating effect wavelength.

130. (Previously Presented) The array of polynucleotides of claim 129, wherein a narrow band of optical wavelengths is reflected from the optical device when the array is illuminated with a broad band of optical wavelengths.

131. (Previously Presented) The array of polynucleotides of claim 129, wherein the substrate comprises glass, plastic or epoxy.

132. (Previously Presented) The array of polynucleotides of claim 129, wherein the two-dimensional grating is comprised of a material selected from the group consisting of zinc sulfide, titanium dioxide, tantalum oxide and silicon nitride.

133. (Previously Presented) The array of polynucleotides of claim 129, wherein the substrate and the two-dimensional grating comprise a single unit, wherein the surface of the single unit comprising the two-dimensional grating is coated with a material having a refractive index greater than the refractive index of the substrate and the material is coated with a cover layer.

134. (Previously Presented) The array of polynucleotides of claim 133, wherein the single unit is comprised of a material selected from the group consisting of glass, plastic, and epoxy.

135. (Previously Presented) The array of polynucleotides of claim 133, wherein the material is selected from the group consisting of zinc sulfide, titanium dioxide, tantalum oxide and silicon nitride.

136. (Previously Presented) The array of polynucleotides of claim 129, wherein the cover layer comprises a material that has a lower refractive index than zinc sulfide, titanium dioxide, tantalum oxide or silicon nitride.

137. (Previously Presented) The array of polynucleotides of claim 136, wherein the cover layer comprises a material selected from the group consisting of glass, epoxy and plastic.

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001

138. (Previously Presented) The array of polynucleotides of claim 129, wherein the two-dimensional grating is comprised of a repeating pattern of shapes selected from the group consisting of squares, circles, ellipses, triangles, trapezoids, sinusoidal waves, ovals, rectangles and hexagons.

139. (Previously Presented) The array of polynucleotides of claim 138, wherein the repeating pattern of shapes are arranged in a rectangular grid or hexagonal grid.

140. (Previously Presented) The array of polynucleotides of claim 129, wherein the two-dimensional grating has a period of about 0.01 microns to about 1 micron and a depth of about 0.01 microns to about 1 micron.

141. (Previously Presented) The array of polynucleotides of claim 129, further comprising an antireflective physical structure that is embossed into a surface of the substrate opposite of the two-dimensional grating.

142. (Previously Presented) The array of polynucleotides of claim 141, wherein the antireflective physical structure is a motheye structure.

143. (Previously Presented) A detection system comprising the array of polynucleotides of claim 129, a light source that directs light to the array of polynucleotides, and a detector that detects light reflected from the array of polynucleotides.

144. (Previously Presented) The detection system of claim 143, further comprising a fiber probe comprising one or more illuminating optical fibers that are connected at a first end to the light source, and one or more collecting optical fibers connected at a first end to the detector, wherein the second ends of the illuminating and collecting fibers are arranged in line with a collimating lens that focuses light onto the array of polynucleotides.

145. (Previously Presented) The detection system of claim 144, wherein the illuminating fiber and the collecting fiber are the same fiber.

146. (Previously Presented) The detection system of claim 143, wherein the light source illuminates the array of polynucleotides from its top surface or from its bottom surface.

147.-153. Canceled.

154. (New) A detection system comprising the biosensor of claim 1, a light source that directs light at the biosensor, and a detector that detects light reflected from the biosensor,

wherein a first fiber probe, which is a collecting fiber probe, having two ends is connected at its first end to the detector, wherein a second fiber probe, which is an illuminating fiber probe, having two ends is connected at its first end to the light source, wherein the first and second fiber probes are connected at their second ends to a third fiber probe, wherein the third fiber probe acts as an illumination and collection fiber probe, and wherein the third fiber probe is oriented at a normal angle of incidence to the biosensor and supports counter-propagating illuminating and reflecting optical signals.

155. (New) A detection system comprising the biosensor of claim 1, a light source that directs light at the biosensor, and a detector that detects light reflected from the biosensor, wherein an illuminating fiber probe is connected to the light source and is oriented at a 90 degree angle to a collecting fiber probe, wherein the collecting fiber probe is connected to the detector, wherein light is directed through the illuminating fiber probe into a beam splitter that directs the light to the biosensor, wherein reflected light is directed into the beam splitter that directs the light into the collecting fiber.

The Amendments

Allowed claim 15 has been amended to change its dependency from canceled claim 12 to allowed claim 1. This amendment is not a narrowing amendment and is not made in response to a rejection. Applicants respectfully request entry of the amendment.

Applicants believe that claims 51 and 52 were inadvertently canceled by the Examiner in the Examiner's Amendment of April 6, 2005. The Examiner noted that Applicants' amendment of claim 51 was acknowledged and entered in the Detailed Action of April 6, 2005. See first paragraph of Detailed Action. Inadvertently canceled claims 51 and 52 have been added as new claims 154 and 155. These amendments add no new matter and Applicants respectfully request their entry.

Respectfully submitted,
McDonnell Boehnen Hulbert & Berghoff LLP

Date: 4/22/05 By: _____
Lisa M. W. Hillman, Ph.D
Reg. No. 43,673

McDonnell Boehnen Hulbert & Berghoff LLP
300 S. Wacker Drive
Chicago, Illinois 60606
312.913.0001